



**Total Maximum Daily Loads
for the
Middle Platte River**

**(Segments MP1-10000, MP1-20000,
MP2-20000 and MP2-40000)**

Parameters of Concern: Fecal coliform Bacteria

**Nebraska Department of Environmental Quality
Planning Unit, Water Quality Division**

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Executive Summary

Three Middle Platte River segments were included on the 2002 Section 303(d) List of Impaired Waters (NDEQ 2002a) due to impairment by excessive fecal coliform. As such, total maximum daily loads must be developed for fecal coliform in accordance with the Clean Water Act. Additionally, segment MP2-40000 was identified as a water quality concern on Part 5 of the 2002 list. Based on the strategy of a basin wide approach as well as the hydrologic connection, a TMDL has also been developed for this waterbody and included. This document presents TMDLs for fecal coliform, that are designed to allow the Middle Platte River to fully support the primary contact recreation beneficial use. The information contained herein should be considered 4 TMDLs.

These TMDLs have been prepared to comply with the current (1992) regulations found at 40 CFR Part 130.7.

1. Name and geographic location of the impaired waterbody for which the TMDLs are being developed.

Middle Platte River: Segments MP1-10000, MP1-20000, MP2-20000 and MP2-40000.

2. Identification of the pollutant and applicable water quality standard

The pollutant causing the impairment(s) of the water quality standard and designated beneficial use is fecal coliform bacteria. Designated uses assigned to the above-identified segments include: primary contact recreation, aquatic life Warmwater class A, agriculture water supply class A and aesthetics (NDEQb 2000). Excessive fecal coliform have been determined to be impairing the primary contact recreation beneficial uses. The applicable water quality standards are a seasonal geometric mean of 200/100 ml with <10% of the samples being greater than 400/100ml.

3. Quantification of the pollutant load that may be present in the waterbody and still allows attainment and maintenance of the water quality standards.

The allowable pollutant load is based upon the available stream flow volume. That is, loading capacities are developed for each flow by multiplying the water quality standard (WQS) by the selected stream flow and a conversion factor (C) with the equation being:

$$\text{Loading capacity} = \text{WQS} * \text{Flow} * C$$

4. Quantification of the amount or degree by which the current pollutant load in the waterbody, including upstream sources that is being accounted for as background loading deviates from the pollutant load needed to attain and maintain water quality standards.

For segments MP1-10000, MP1-20000, MP2-20000 and MP2-40000, the seasonal geometric mean were monitored to be exceeded by: 197/100 ml, 11.1/100 ml, 450.7/100 ml and 0/100 ml respectively. The percentage (%) of samples exceeding 400/100 ml ranged from 19-60%.

5. Identification of the pollutant source categories.

Both point and nonpoint sources (including natural sources) have been identified to be contributing to the pollutant loads being delivered to the Middle Platte River segments.

6. Wasteload allocations for pollutants from point sources.

The wasteload allocations for point source discharges will be equivalent to the water quality criteria associated with the primary contact recreation beneficial use. Therefore, the WLA is a monthly geometric mean of 200/100 ml and a daily maximum of 400/100 ml.

7. Load allocations for pollutants from nonpoint sources.

The load allocations assigned to these TMDLs will be based upon the stream flow volume and will be defined as:

$$LA_i = Q_i * 400/100 \text{ ml} * C$$

Where:

LA_i = load allocations at the i^{th} flow

Q_i = stream flow at the i^{th} flow

400/100 ml = applicable/target water quality criteria for fecal coliform from Title 117

C = conversion factor

8 A margin of safety.

These TMDLs contain an implicit margin of safety. Specifically, decay/die-off from the potential source to the recreational segment was not included in the pollutant source evaluation, all point sources were assumed to be discharging the expected concentration and the targeted reductions will result in seasonal geometric means well below the applicable water quality criteria.

9. Consideration for seasonal variation.

The water quality criteria are only applicable during the Title 117 defined recreation season that starts May 1 and ends September 30. Because of this, the water quality and stream volume data was limited to this time period.

10. Allowances for reasonably foreseeable increases in pollutant loads.

There was no allowance for future growth included in these TMDLs.

11. Implementation Plan

Implementation of the reductions for fecal coliform will be carried out through a combination of regulatory and non-regulatory activities. Point sources will be regulated under the auspice of the National Pollutant Discharge Elimination System and the Rules and Regulations Pertaining to Livestock Waste Control. Nonpoint source pollution will be addressed using available programs, technical advice, information and educations and financial incentives such as cost share.

The TMDLs included in the following text can be considered “phased TMDLs” and as such are an iterative approach to managing water quality based on the feedback mechanism of implementing a required monitoring plan that will determine the adequacy of load reductions to meet water quality standards and revision of the TMDL in the future if necessary. A description of the future monitoring (Section 4.0) that is planned has been included. .

Monitoring is essential to all TMDLs in order to:

- Assess the future beneficial use status;
- Determine if the water quality is improving, degrading or remaining status quo;
- Evaluate the effectiveness of implemented best management practices.

The additional data collected should be used to determine if the implemented TMDL and watershed management plan have been or are effective in addressing the identified water quality impairments. As well the data and information can be used to determine if the TMDLs have accurately identified the required components (i.e. loading/assimilative capacity, load allocations, in lake response to pollutant loads, etc.) and if revisions are appropriate.

1.0 Introduction

Five designated segments within the Middle Platte River basin were listed on the 1998 Section 303(d) list of impaired waters (NDEQ 1998) as not supporting the primary contact recreation beneficial use with the pollutant of concern being pathogens (fecal coliform bacteria). Additional information was collected during the 2001 recreation season (May 1 to September 30) as part of the rotating basin monitoring scheme, for additional beneficial use assessments and to support the development of the total maximum daily loads (TMDLs). This new data indicated a designated stream segment not included on the 1998 list was not supporting primary contact recreation, two of the previously identified segments were supporting the use and the data did not yield a conclusive decision on a fourth segment. Therefore, the 2002 Section 303(d) list will include 3 waterbodies on Part 1; one waterbody on Part 5 and 2 waterbodies will be “de-listed”. Table 1.0 presents this information.

Table 1.0 Section 303(d) Listing Summary for the Middle Platte River Segments in 1998 and 2002

Segment	1998 303(d) List	2002 303(d) List
MP1-10000	No	Part 1
MP1-20000	Yes	Part 1
MP2-10000	Yes	No
MP2-20000	Yes	Part 1
MP2-30000	Yes	No
MP2-40000	Yes	Part 5

Based on the above, and as required by Section 303(d) of the Clean Water Act and 40 CFR Part 130, TMDLs have been developed for the impaired waters identified on the 2002 Section 303(d) list. The approach for these TMDLs will be to address all of the identified waterbodies simultaneously or as a watershed. Based on this, the information contained herein should be considered 4 TMDLs.

1.1 Background Information

The Middle Platte River Basin, located in central Nebraska (Figure 1.1) extends from the confluence of the North and South Platte Rivers on the western end to the confluence with Loup Power Canal return on the eastern end, where the basin gives way to the Lower Platte River Basin. Stream flow volume in the Middle Platte River is heavily controlled by many irrigation withdrawals and returns including the control offered by the state’s largest reservoir - Lake McConaughy that actually lies in the North Platte Basin. Demands for the water and a lack of precipitation can result in some reaches of the Platte River going dry during the summer. Several municipalities lie in the basin ranging from first class cities to villages. Also, Interstate-80 dissects the western 2/3 of the basin.

1.1.1 Waterbody Information

1.1.1.1 Waterbody Name(s): (Middle) Platte River

Stream Identification Numbers: MP1-10000, MP1-20000, MP2-20000 and MP2-40000

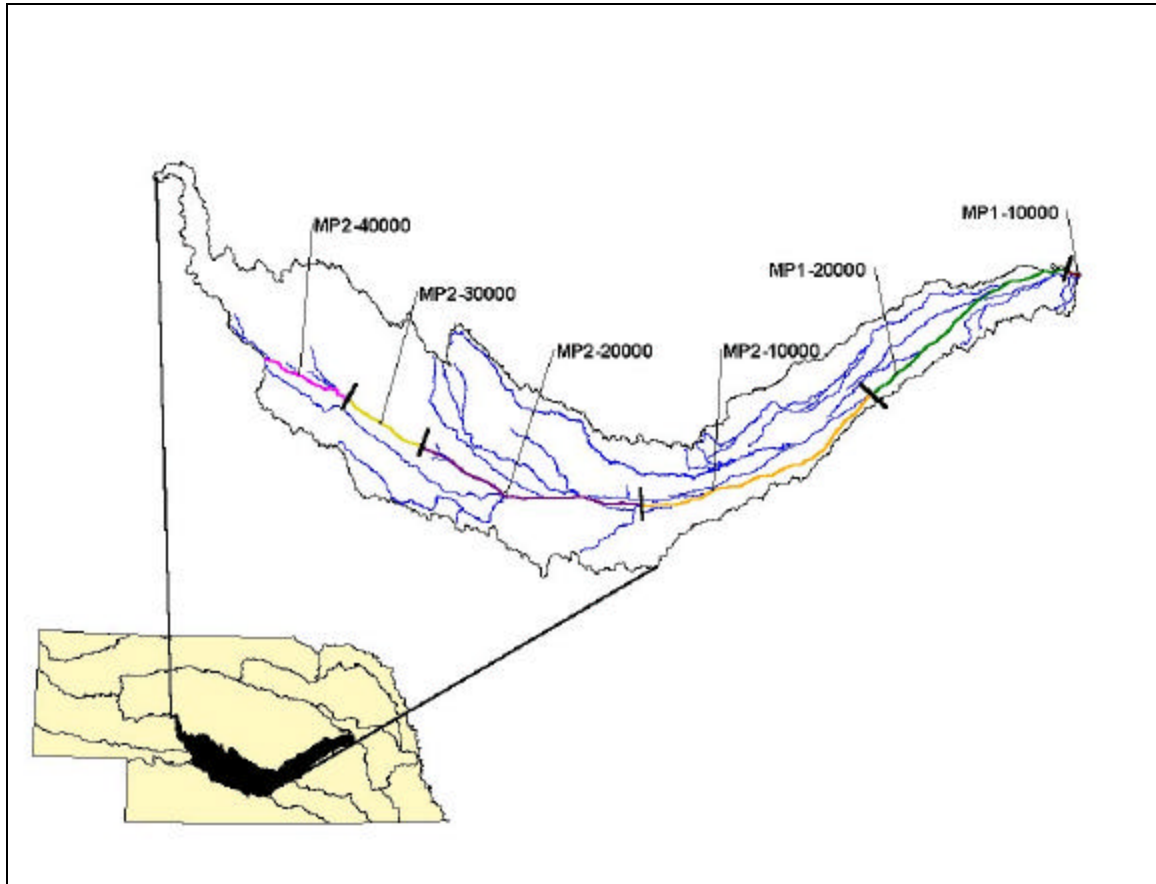
1.1.1.2 Major River Basin: Missouri River

1.1.1.3 Minor River Basin: Middle Platte

1.1.1.4 Hydrologic Unit Codes: 10200101, 10200102 and 10200103

1.1.1.5 Assigned Beneficial Uses: Primary Contact Recreation, Aquatic Life Warmwater Class A, Agricultural Water Supply Class A and Aesthetics. (Title 117 – Nebraska Surface Water Quality Standards) (Title 117).

Figure 1.1 Location of Middle Platte River Basin



1.1.1.6 Major Tributaries: North and South Platte Rivers, Clear Creek, Prairie Creek, Silver Creek, Wood River, Whitehorse Creek

Table 1.1 Physical Description of Middle Platte River Basin

Parameter	Middle Platte River
State	Nebraska
Counties (whole or in part)	Platte, Polk, Nance, Merrick, Hamilton, Howard, Hall, Adams, Kearney, Buffalo, Phelps, Gosper, Dawson, Custer, Frontier, Logan, Lincoln, McPherson
Watershed Area	5,130 mi ² (approximate)
Drainage	61,000 mi ² (approximate)
Sub-basins	2
Designated Stream Segments	29
Stream Miles (designated)	665 miles

1.1.2 Watershed Characterization

1.1.2.1 Physical Features: The Middle Platte River watershed covers approximately 5,130 mi² and occupies a narrow strip in central Nebraska. The majority of the basin lies in the Central Great Plains ecoregion with the northwest portion of the basin lying in the Nebraska Sandhills ecoregion (Chapman, et. al. 2001). Agriculture dominates the land use with row crops being grown in the valleys and bottomlands and range being predominant in the upland and Sandhills region. Irrigation is a common used practice in the basin, with the water source being both surface and ground water.

Soils of the basin vary from sands of the valley alluvium along the Platte River and in the Sandhills to the fertile loess soils of the plains and tablelands. The dissected plains and loess hills have a well-developed drainage pattern that discharge onto the poorly drained flat valley lands. The valley is quite broad through the central portion and the drainage pattern becomes less well developed toward the eastern end of the Basin. Large deposits of sand and gravel have been mined extensively, mainly for use in concrete aggregate or road surfacing (NNRC 1975).

In the past, demands for the Platte River water have resulted in segments of the river going dry. In 1997, a cooperative agreement was entered into by the states of Colorado, Wyoming, and Nebraska and the U.S. Fish and Wildlife Service whereby “sufficient water” will be provided to support and sustain four targeted threatened or endangered species (Piping Plover, Interior Least Tern, Whooping Crane and Pallid Sturgeon).

Water from the basin is also used for industrial cooling purposes and hydroelectric generation.

1.1.2.2 Climate: Precipitation ranges from an annual average of 20 inches in the western end of the basin to 27 inches at the eastern end of the basin. Typically, a majority of the precipitation occurs during the spring and early summer. Temperatures in the basin range from an average high in the upper 80’s during the summer to average lows in the 10’s during the winter (NRC databank).

1.1.2.3 Demographics: Thirty-one municipal communities lie in the Middle Platte basin boundaries and range from first class cities to villages. Some of the larger communities include: Grand Island – population 42,940, Kearney – population 27,431, Columbus – population 20,971, Lexington – population 10,011, Cozad – population 4,163 and Central City – population 2,998.

1.1.2.4 Land Use: Agriculture dominates the land use with upland areas and the Sandhills region being primarily range and pastureland and row crops being grown in the lowland and valleys. Much of the area is irrigated by either surface water or groundwater. Approximately ¼ of registered wells in Nebraska are located in the basin (NDEQa 2000). Corn, soybean and alfalfa are the predominant crops with lesser extents of others being grown. Livestock production is also common.

2.0 Fecal coliform TMDL

2.1 Problem Identification

Segments MP1-10000, MP1-20000, MP2-20000 were listed on the 2002 Section 303(d) list as impaired by excessive fecal coliform and segment MP2-40000 was listed as a water quality concern (NDEQa 2002). This section deals with the extent and nature of the water quality impairments caused by excessive fecal coliform in the Middle Platte River basin.

2.1.1 Water Quality Criteria Violated and/or Beneficial Uses Impaired

The *Primary Contact Recreation* beneficial use has been deemed impaired or threatened on the above-identified four segments. The *Primary Contact Recreation* beneficial use applies to surface waters which are used or have the potential to be used for primary contact recreation that includes activities where the body may come into prolonged or intimate contact with the water such that water may be accidentally ingested or sensitive body organs (e.g. eyes, ears, nose) may be exposed (NDEQb 2000).

2.1.2 Data Sources

The Nebraska Department of Environmental Quality (NDEQ) monitors surface waters based upon a rotating basin scheme, whereby monitoring is limited to 2 or 3 river basins each year with all 13 basins being (partially) examined in a 5 year period. Under the auspice of the rotating basin plan, data was collected from the Middle Platte River basin in 1996 and 2001. The 1996 data was used for Section 303(d) and Section 305(b) assessment however the lack of corresponding stream flow information presents some obstacles for use in the TMDLs. Data collected in 2001 included stream flow (volume) information and will be used for these TMDLs. Stream flow data and information were obtained from the United States Geological Survey (USGS) and Nebraska Department of Natural Resource (NDNR) who operate the monitoring gages.

2.1.3 Water Quality Assessment

Water quality data assessments were based upon the beneficial use assessment procedures used to identify impaired waters for the 2002 Section 303(d) list. The procedures are based on a two-tiered approach. The first approach being a screen based upon EPA's recommended 305(b) guidance. The second step is an application of the "binomial distribution" method that applies a confidence interval to the exceedance rate in an effort to determine the true exceedance of the waterbody versus the data set. A complete description of the water quality data assessment procedures can be found in the *Methodology for Waterbody Assessment and Developing the 2002 Section 303(d) List of Impaired Waterbodies for Nebraska* – December 2001.

The process used in assessing data to determine the use support of the *Primary Contact Recreation* beneficial use can be found in table 2.1.3.

Table 2.1.3: Assessment of the Primary Contact Recreation Beneficial Use Using Fecal coliform Bacteria data.

Minimum Samples	Full Support	Partially Supporting	Not Supporting	Water Quality Concern
10	Season geometric mean $\leq 200/100$ ml and $\leq 10\%$ of samples exceed $400/100$ ml	Season geometric mean $\leq 200/100$ ml but $>10\%$ of samples exceed $400/100$ ml	Season Geometric mean $>200/100$ ml	
4 –9	Not assessed for full support with <10 samples	Not assessed for partially supporting with <10 samples	Not assessed for not supporting with <10 samples	Season Geometric mean $>200/100$ ml and/or $>10\%$ exceedance $400/100$ ml

2.1.4 Water Quality Conditions

Fecal coliform data collected during the 2001 recreation season (May through September) was assessed to determine the beneficial use support for the segment designated for primary contact recreation. Table 2.1.4 presents the results of the monitoring.

Table 2.1.4 Middle Platte River – 2001 Assessed Fecal coliform Data and Assessments

Segment	Site Location	USGS/DNR Gage Associated with Site	Number of Samples	Season Geometric Mean (#/100 ml)	# Samples >400/100 ml	% Samples >400/100 ml
MP1-10000	Platte River East of Columbus	None	17	397	8	47%
MP1-20000	Platte River at Duncan	06774000	22	211.1	7	32%
MP2-10000	Platte River at Grand Island	06770500	21	101.6	2	9.5%
MP2-20000	Platte River at Kearney	06770200	20	650.7	12	60%
MP2-30000	Platte River at Cozad	06766500	21	88.3	1	4.8%
MP2-40000	Platte River at Brady	06766000	21	115.8	4	19%

2.1.5 Potential Pollutant Sources

2.1.5.1 Point Sources: Several point sources discharge or have the potential to discharge to waters in the Middle Platte River basin. Facility types include: municipal wastewater treatment facilities, landfills, confined animal feeding operations, commercial facilities treating sanitary wastewater and, meat packing facilities. The National Pollutant Discharge Elimination System (NPDES) permitted facilities (according to EPA's Permit Compliance System) that regularly discharge to the Middle Platte Basin are shown in Figure 2.1.5.1a. Other NPDES permitted facilities such as some of the animal feeding operations and other lagoons are shown in Figure 2.1.5.1b. Urban stormwater can be a pollutant source and is subject to regulation under the NPDES program. Several municipalities are considered candidates based upon the population however thus far only Lincoln and Omaha have been required to apply for and obtain the NPDES – MS4 permits.

Illicit connection, discharges, combined sewer overflows and sanitary sewer overflows can also be sources of fecal coliform

Animal feeding operations that have been issued State of Nebraska permits, required for construction and operation of livestock waste control facilities (LWCF) if the operation has discharged, or has the potential to discharge, livestock waste to waters of the State are also considered potential sources. Figure 2.1.5.1c shows the facilities within the Middle Platte Basin. These facilities are designed to contain any run-off that is generated by storm events that are less in intensity than the 25 year, 24-hour rainfall.

2.1.5.2 Nonpoint Sources: Several nonpoint sources of fecal coliform exist in the Middle Platte River Basin. These sources include: failing septic tanks or other on-site wastewater systems, run-off from livestock pastures, improper or over-application of biosolids (wastewater treatment facility sludge, septage or manure) and urban stormwater runoff not regulated by an NPDES permit.

2.1.5.3 Natural Sources: The primary natural source of fecal coliform is wildlife. A variety of wildlife are native to or have adapted to the diverse habitat of the Middle Platte River Basin (NNRC 1975). Big game, upland game, furbearers, waterfowl and non-game species have been documented to reside within the basin.

2.2 TMDL Endpoint

The endpoint for these TMDLs will be based on the numeric criteria associated with the *Primary Contact Recreation* beneficial use.

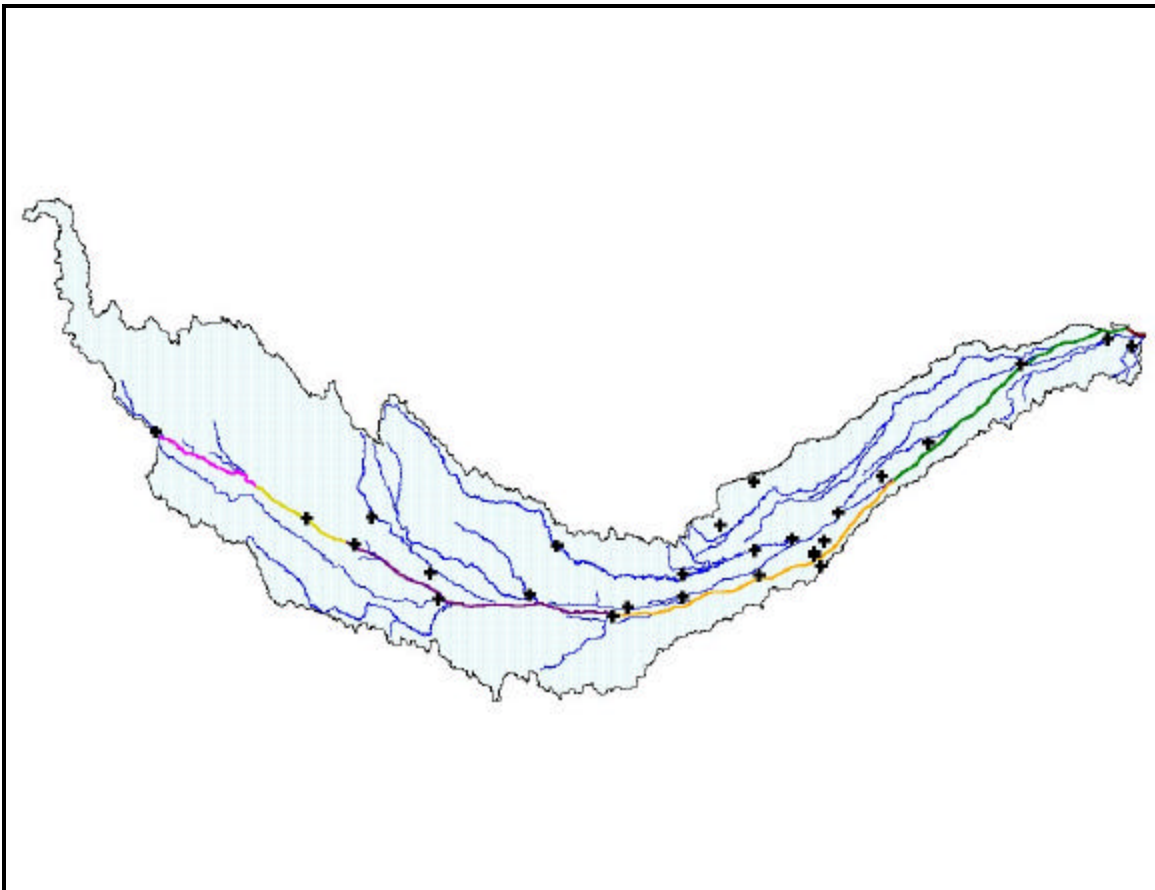
2.2.1 Numeric Water Quality Criteria

Water quality criteria established for the protection of the *Primary Contact Recreation* beneficial use can be found in Title 117, Chapter 5 and are as follows:

Bacteria of the Fecal coliform group shall not exceed a geometric mean of 200/100 ml, nor exceed 400/100 ml, in more than 10% of the samples. These criteria are based upon a minimum of 5 samples taken within a 30-day period. This does not preclude fecal coliform limitations based on effluent guidelines.

These criteria apply during the recreational period of May 1 through September 30.

2.1.5.1a NPDES Permitted Facilities Discharging to the Middle Platte Basin that are Potential Fecal coliform Sources



2.2.2 Selection of Critical Environmental Conditions

The water quality criteria associated with the *Primary Contact Recreation* beneficial use only applies from May 1 through September 30. Therefore, the critical conditions for these TMDLs will be those occurring from May 1 through September 30.

2.2.3 Waterbody Pollutant Loading Capacity

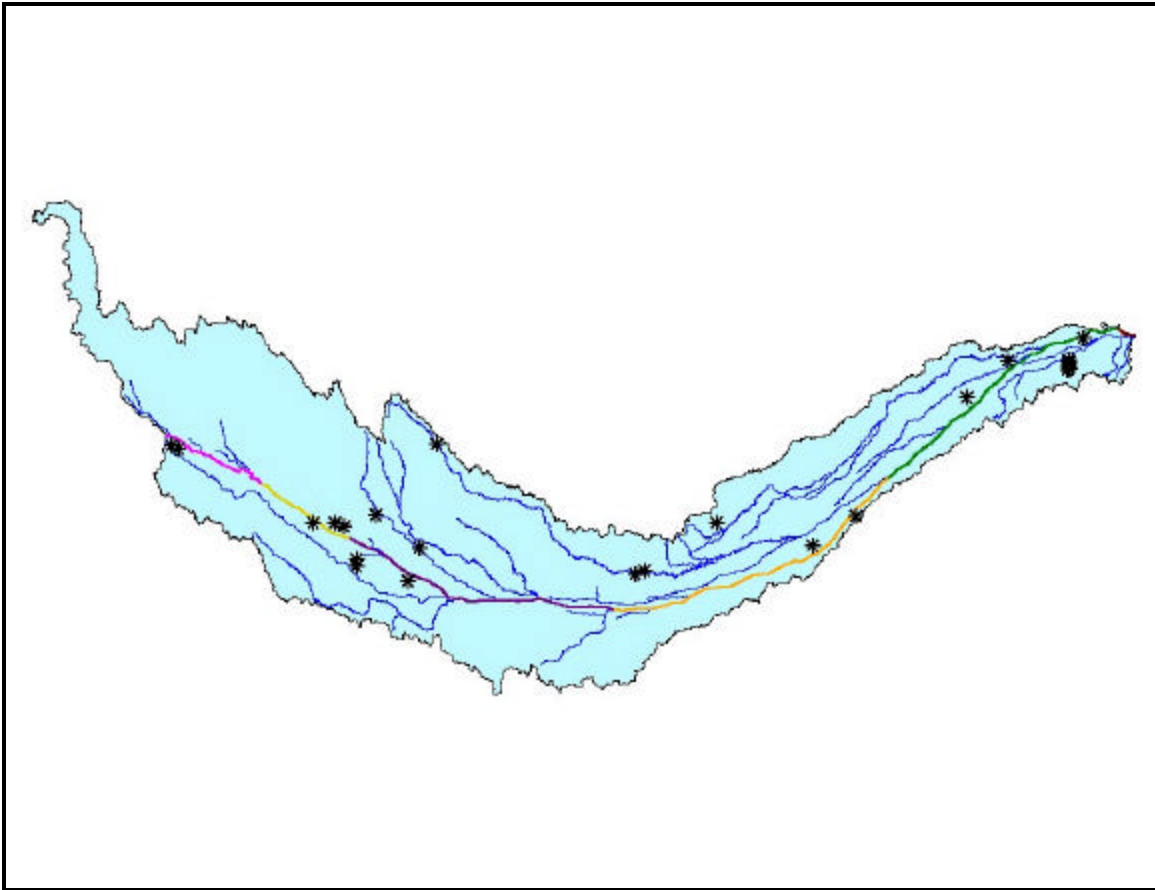
Defining waterbody pollutant loading capacity implies a steady state. The TMDL recognizes loadings are dynamic and can vary with stream flow. As well, the above section indicates a wide range of environmental conditions that must be accounted for.

The method chosen to account for the variation in flow is based upon a load duration curve. Load duration curves are initiated by the development of a stream's hydrograph using the long-term gage information. The flow information (curve) is then translated into a load curve by multiplying the flow values by the water quality standard (WQS) and a conversion factor (C). The acceptable "load" is then plotted graphically.

Therefore, the loading capacity for each of the segments will be defined by:

$$\text{Loading capacity} = \text{WQS} * \text{Flow} * C$$

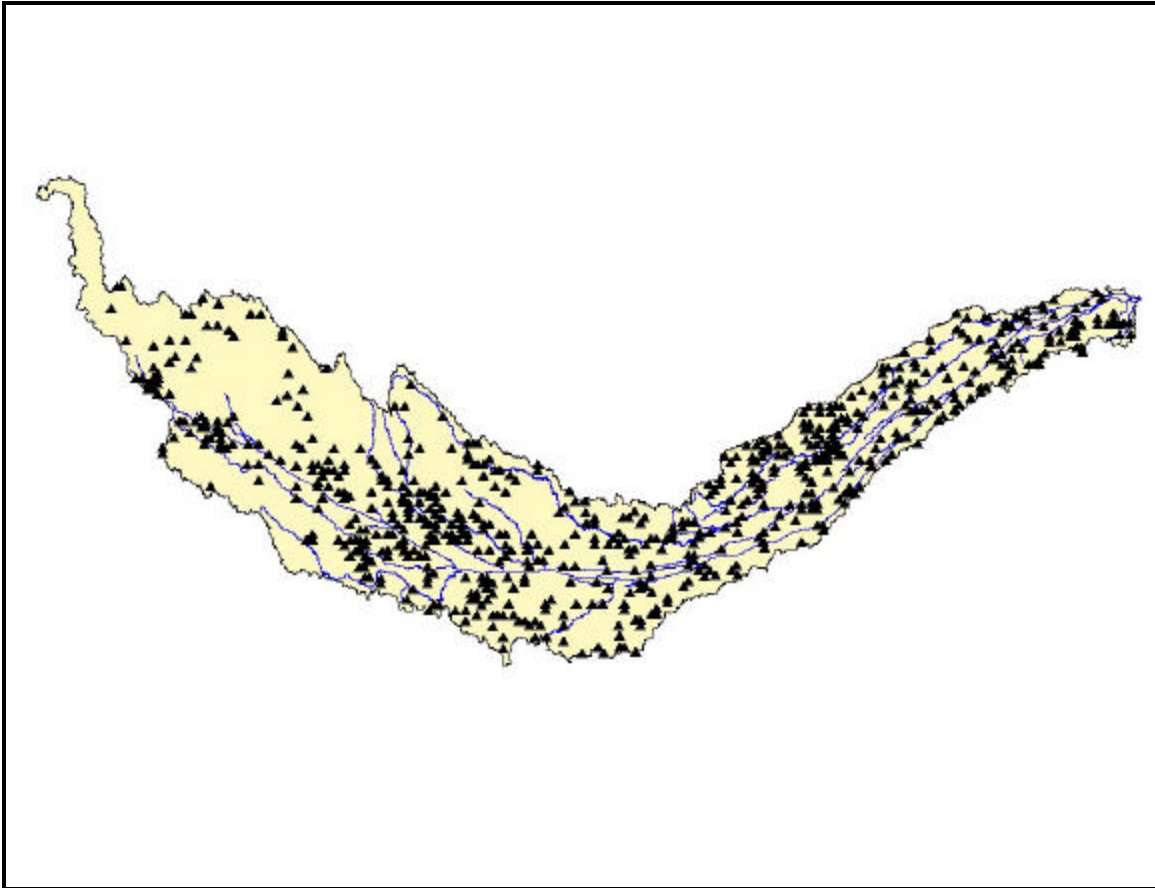
2.1.5.1b NPDES Permitted Facilities in the Middle Platte Basin that are Considered Non-discharging



2.3 Pollutant Source Assessment

For these TMDLs the source loading is based upon the position of the monitoring data points in relation to the boundary established on the load duration curve between point source and nonpoint source influences. This process for selecting the load point is described in the document entitled *Nebraska's Approach for Developing TMDLs for Streams Using the Load Duration Curve Methodology*.

Figure 2.1.5.1c Animal Feeding Operations in the Middle Platte Basin Issued or Requesting a State Construction or Operating Permit or Requesting an Inspection.



2.3.1 Existing Pollutant Conditions

The existing pollutant conditions are shown in the load duration curves (Figure 2.3.1a, 2.3.1b, 2.3.1c and 2.3.1d) provided for each of the segments where a TMDL has been developed. The points plotted above the acceptable loading indicate a deviance from the water quality sample.

2.3.2 Deviation from Acceptable Pollutant Loading Capacity

Table 2.3.2 describes the deviation from the acceptable water quality standards based upon the 2001 monitoring information.

Table 2.3.2 Deviation From the Applicable Water Quality Criteria

Segment	Observed Season Geometric Mean (#/100 ml)	#/100 ml Above WQS	# Samples >400/100 ml	# of Samples Greater than allowed to meet WQS
MP1-10000	397	197	8	7
MP1-20000	211.1	11.1	7	5
MP2-20000	650.7	450.7	12	10
MP2-40000	115.8	0	4	2

Figure 2.3.1a. Load Duration Curve for MP1-10000

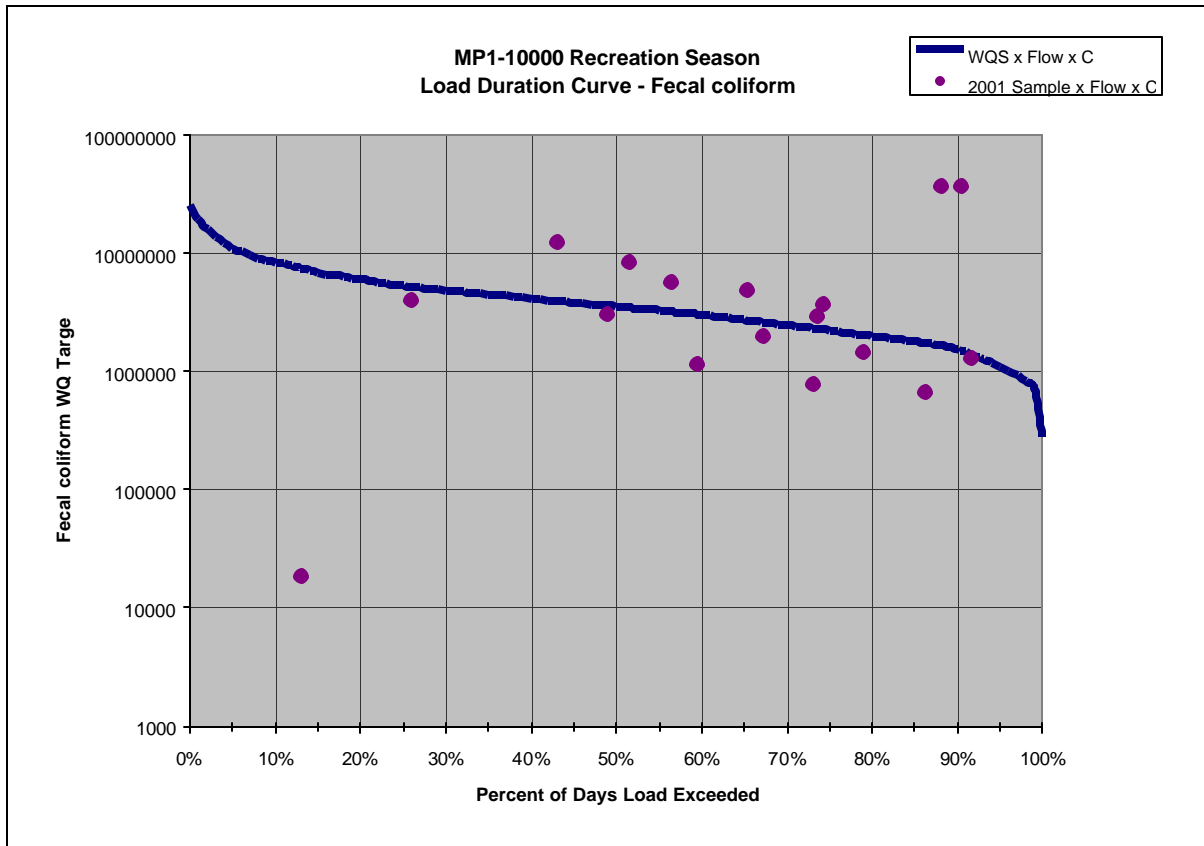


Figure 2.3.1b. Load Duration Curve for MP1-20000

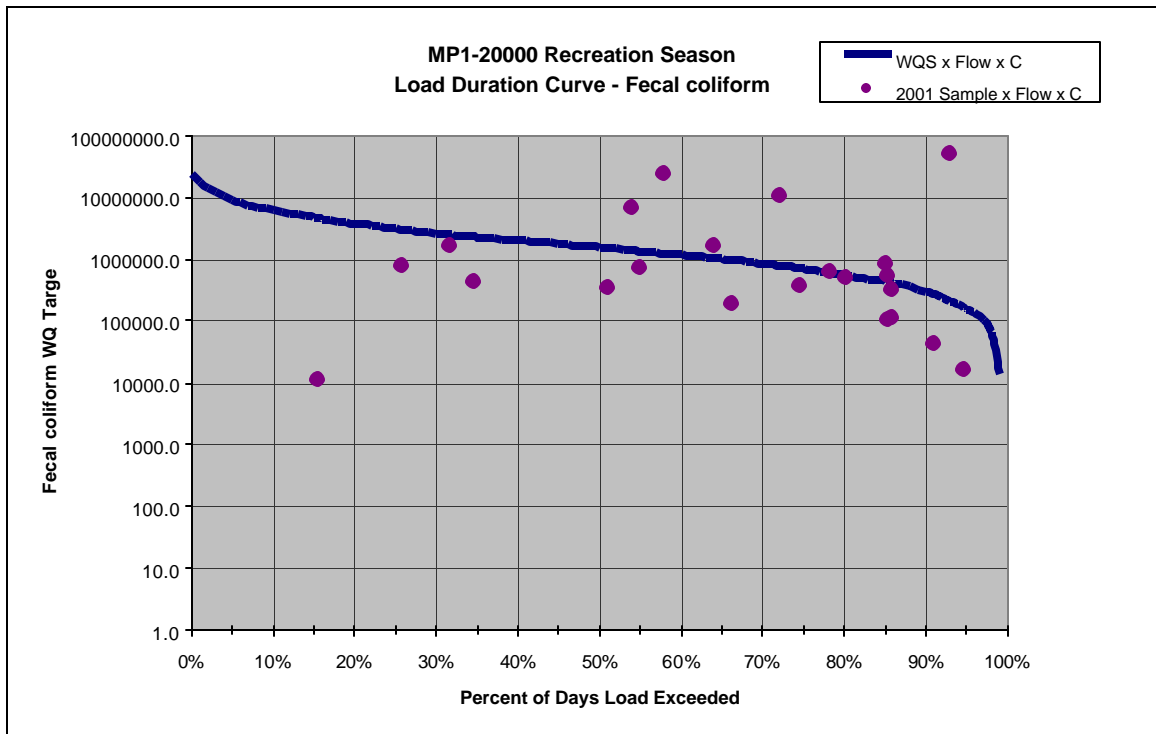


Figure 2.3.1c. Load Duration Curve for MP2-20000

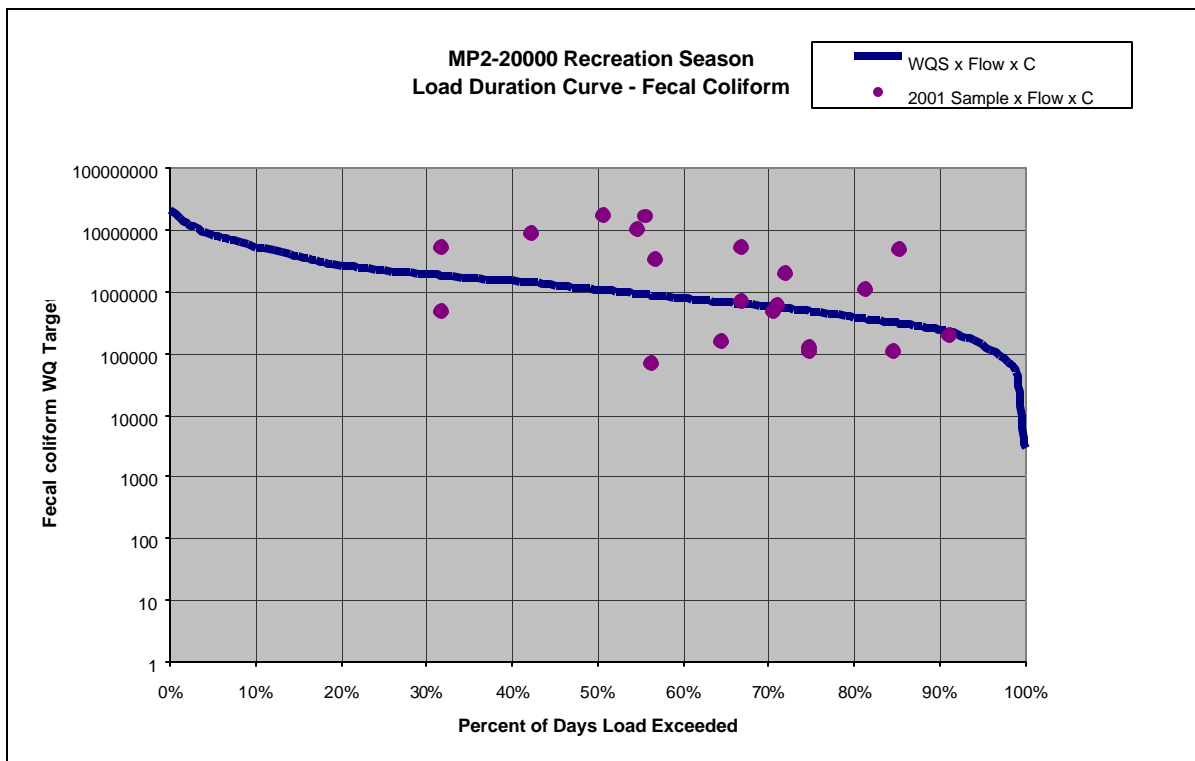
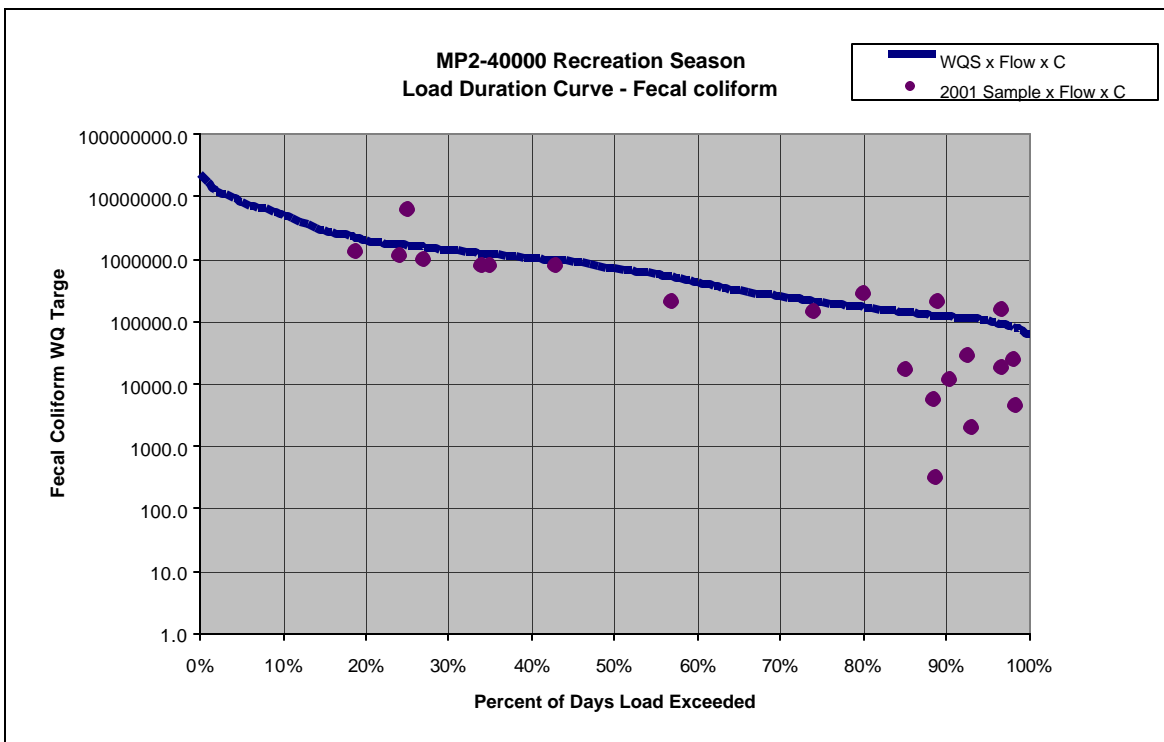


Figure 2.3.1d. Load Duration Curve for MP2-40000



2.3.3 Identification of Pollutant Sources

Both point and nonpoint sources are known to exist in the Middle Platte River Basin and contributing watersheds. Due to the size of the watersheds, the somewhat limited data, the delivery methods and the location of the potential sources in relation to the impaired waterbody it is difficult to definitively identify specific sources. It is important to note that all potential sources may not contribute to the water quality impairments and some sources may contribute at a greater degree than others.

The method utilized to determine the contributions of the sources will be based upon a demarcation where point source discharges are not expected to further impact the waterbody. That is, based on the concept of a continuous and relatively constant effluent volume, a dilution or flow value can be determined where point sources are no longer expected to contribute to water quality excursions. The process is explained in the document entitled *Nebraska's Approach for Developing TMDLs for Streams Using the Load Duration Curve Methodology*.

As explained in the above cited document, an “expected pollutant concentration” must be selected. Fecal coliform concentrations in wastewater can vary greatly, depending upon treatment technology, wastewater strength, industrial contributions, treatment efficiency and season. The selection of an all-encompassing effluent density value must then account for these and other variables. To that end, the NDEQ has collected effluent fecal coliform information from several facilities not providing disinfection of the wastewater discharge. The data was collected from 24 facilities that include both mechanical and lagoon facilities and as seen in Figure 2.3.3a, exhibits a normal distribution. The median value was selected as the input for the “expected pollutant concentration”. The equation to determine the point source/nonpoint source boundary then becomes:

$$Q_s = (10,200/100 \text{ ml} * \Sigma Q_e)/400/100 \text{ ml}$$

Where:

- Q_s = stream flow volume necessary to meet water quality standards
 10,200/100 ml = expected fecal coliform density from point sources
 ΣQ_e = sum of **all** design flows from point sources discharging to the segment (direct or via tributaries)
 400/100 ml = water quality standard

The values for ΣQ_e can be found in Table 2.3.3 as can the boundary flows. For these TMDLs the “not to exceed ” value was chosen as the applied water quality standard rather than the seasonal geometric mean. The reason for this selection is two fold: 1) the TMDL/load duration process evaluates compliance based on individual points and 2) the reductions necessary to achieve mean compliance with the not to exceed criteria result in compliance with the seasonal geometric mean.

Table 2.3.3 Sum of Wastewater Treatment Facility Design Flows in the Middle Platte Basin

Segment	Total Number of Facilities	Sum of Contributing Facility Design Flows	Flow Value for Point vs. Nonpoint Boundary
MP1-10000	2	2.24 cfs	680 cfs*
MP1-20000	11	28.52 cfs	727 cfs
MP2-20000	5	9.21 cfs	235 cfs
MP2-40000	1	0.0012 cfs	82 cfs*

*7q10 Values

The identification of pollutant sources and impacts are shown in figures 2.3.3b-e.

Figure 2.3.3a. Fecal coliform Data from 24 Wastewater Treatment Facilities

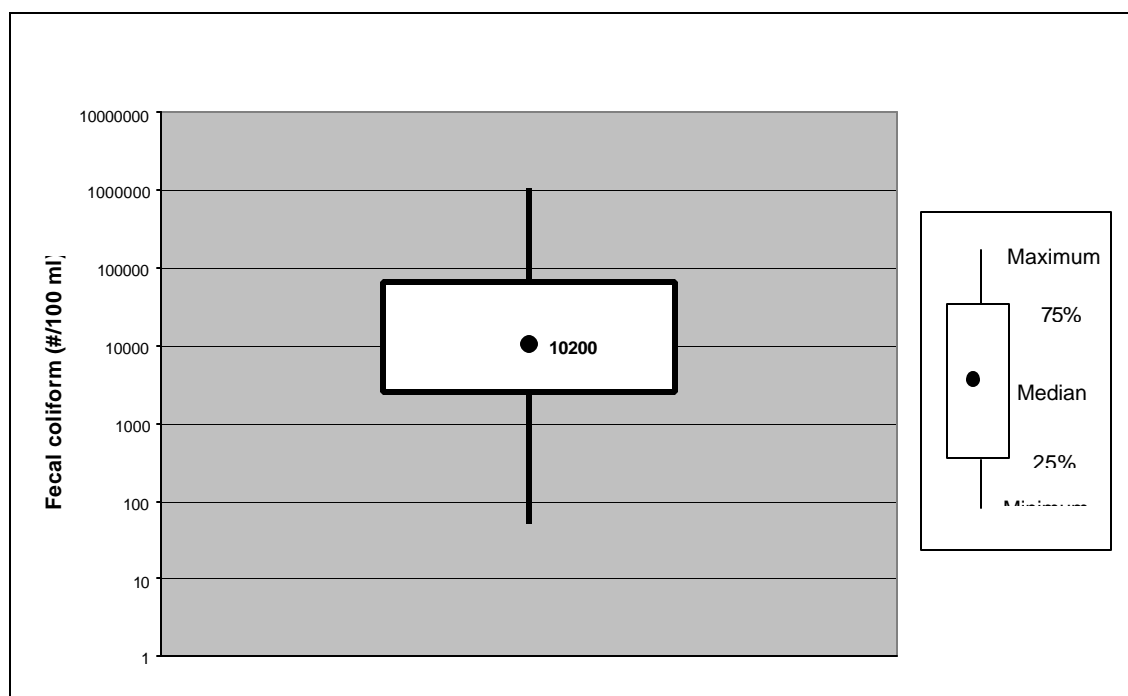


Figure 2.3.3b. Identification of Pollutant Sources Using the Load Curve for MP1-10000

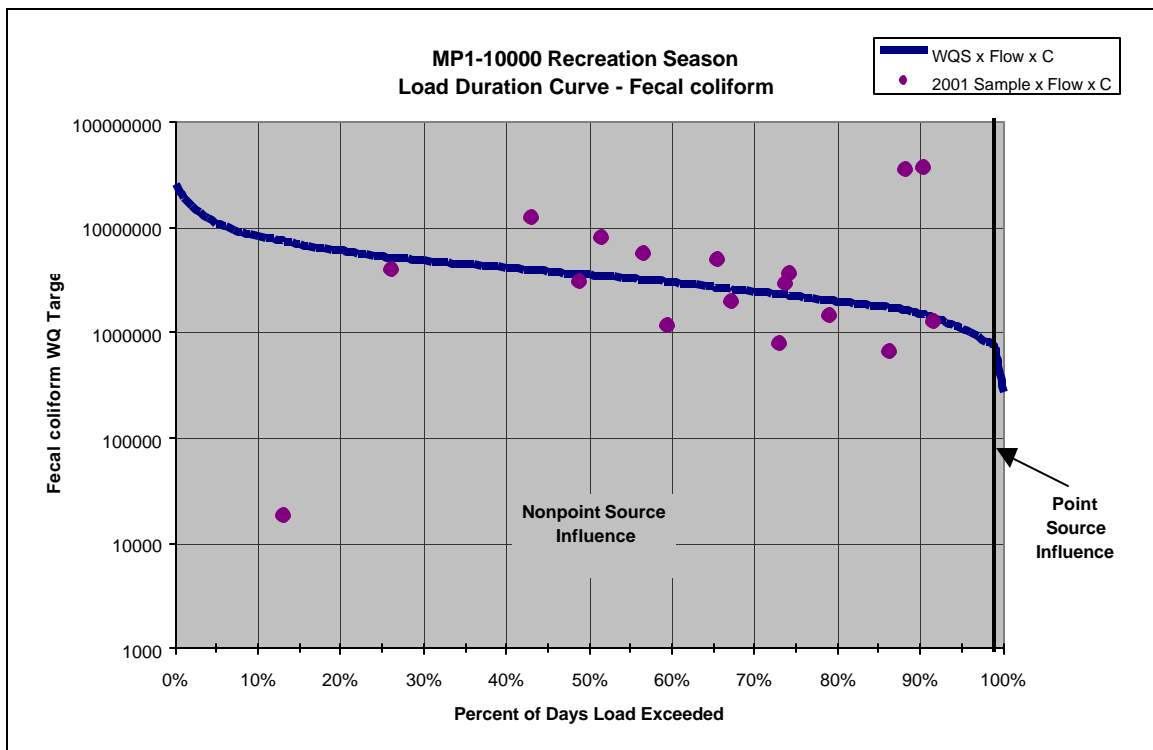


Figure 2.3.3c. Identification of Pollutant Sources Using the Load Curve for MP1-20000

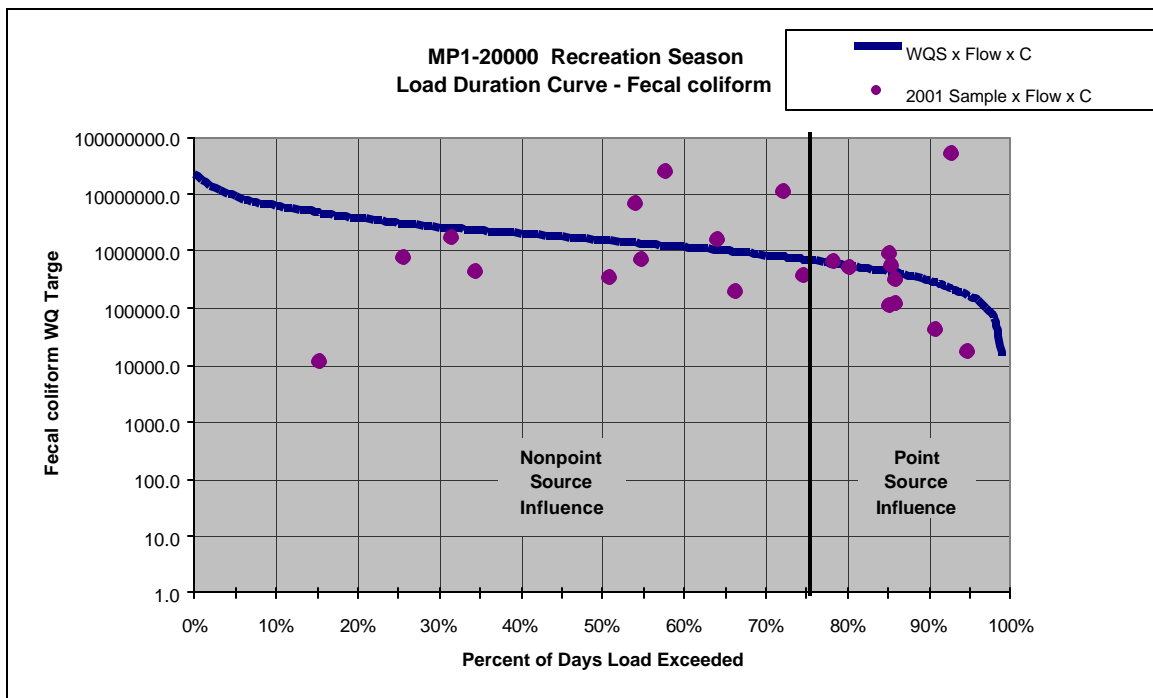


Figure 2.3.3d. Identification of Pollutant Sources Using the Load Curve for MP2-20000

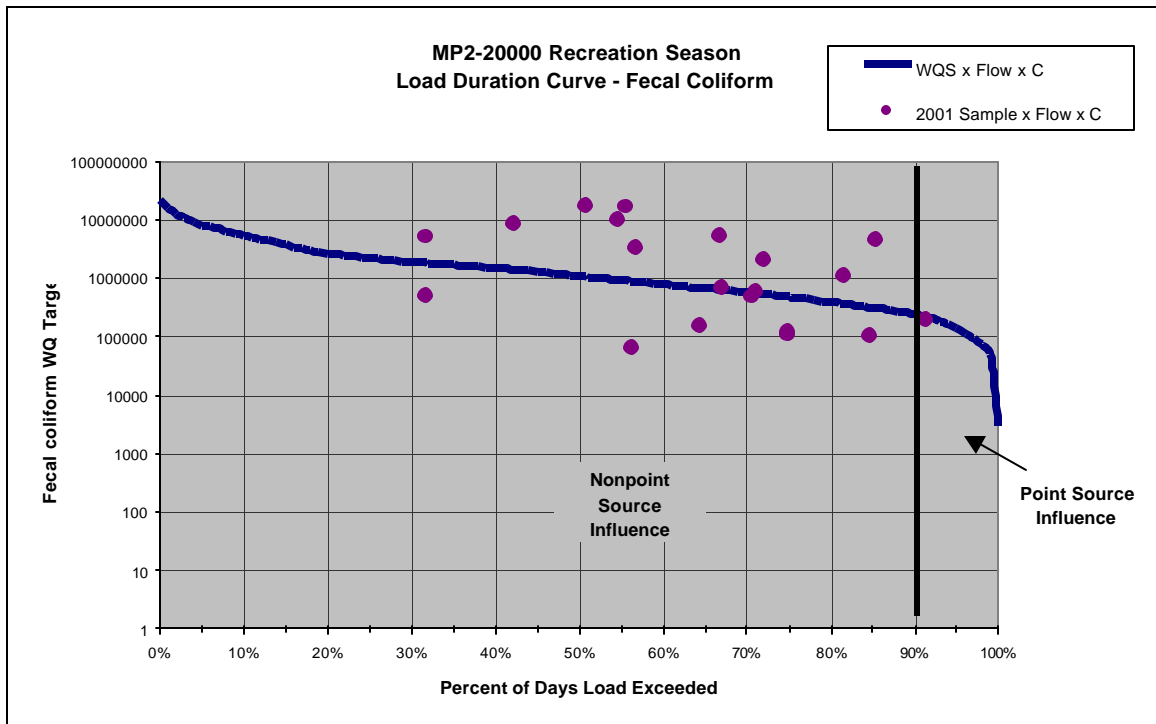
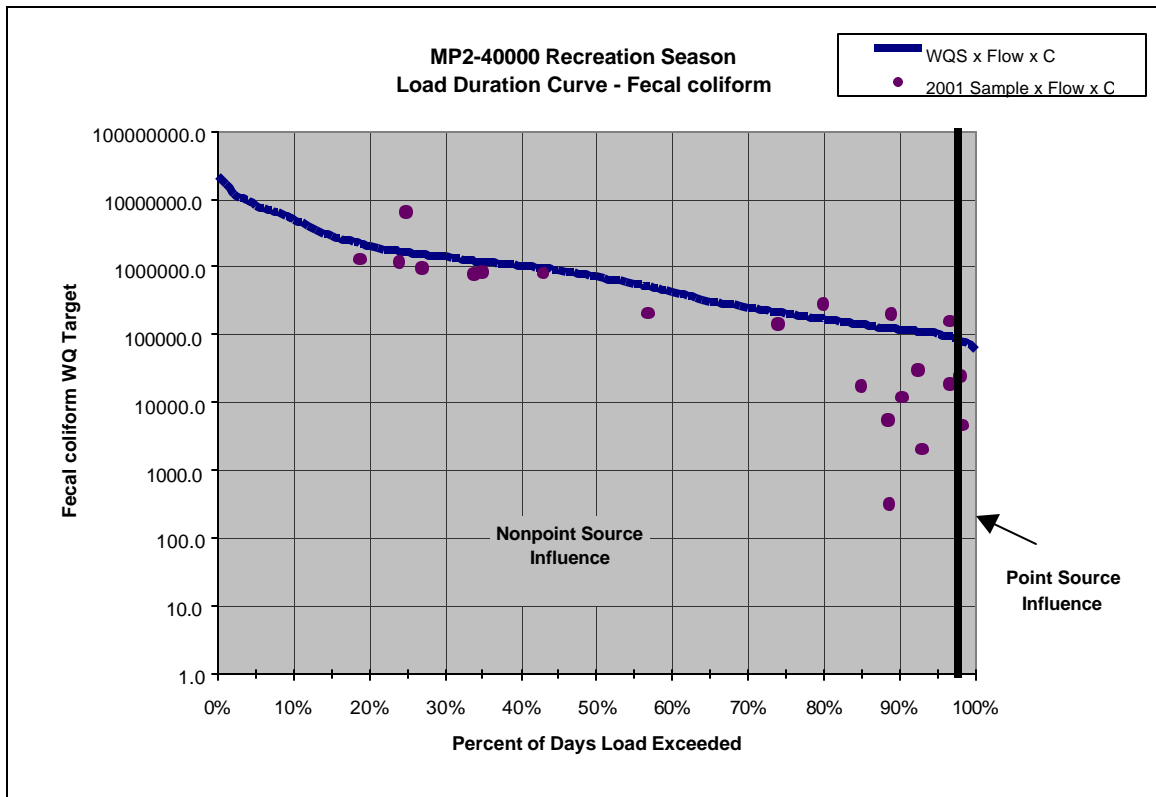


Figure 2.3.3e. Identification of Pollutant Sources Using the Load Curve for MP2-40000



2.3.3.1 Point Sources of Fecal coliform: Based upon the load curves and the position of the monitoring data points, it appears point sources are contributing to the fecal coliform impairment within Segment MP1-20000. Although not identified as playing a significant role by the remaining load curves, several facilities discharge either directly to or into a tributary of the Middle Platte Recreation segment and are listed in Table 2.3.3.1.

Other sources that are classified as point sources and will be acknowledged include municipal stormwater discharges, unpermitted (i.e., cross connections or illicit) sanitary or industrial discharges and failing individual treatment systems (e.g., septic tanks, lagoons).

2.3.3.2 Nonpoint and Natural Sources of Fecal Coliform: Due to the diverse nature, distribution and delivery method, nonpoint and natural sources will not be separated. Therefore, the monitoring data that lie above the duration curve are considered to be the result of nonpoint and natural background sources.

Along with the use of the load curves to identify the sources, monitoring data collected from selected Middle Platte River tributaries has been included in Appendix B.

2.4 Pollutant Allocation

A TMDL is defined as:

$$\text{TMDL} = \text{Loading Capacity} = \text{WLA} + \text{LA} + \text{Background} + \text{MOS}$$

As stated above, the loading capacity is based upon flow position in the hydrograph and is defined by:

$$\text{Load Capacity} = \text{Flow} \times 400/100 \text{ ml} \times C$$

Where:

Flow = Stream flow volume (cubic feet per second)

400/100 ml = applicable/target water quality criteria for fecal coliform from Title 117

C = conversion factor.

By regulation, a TMDL requires a loading capacity value for the pollutant of concern. In the case of fecal coliform, a "load" (flow rate x concentration x time) could be calculated, but the approach may not be appropriate for expressing this non-conservative parameter. Therefore, for the purposes of these TMDLs, a loading capacity will not be "calculated" but will be expressed as the water quality standard. Because the water quality is expressed as a concentration, the LC will not equal the WLA + the LA.

To achieve the desired loading capacities requires the following allocations:

2.4.1 Wasteload Allocations

2.4.1.1 NPDES Permitted Facilities: Title 117 does not allow for the application of a mixing zone for the initial assimilation of effluents in order to meet the criteria associated with the recreation beneficial use. Because of this, the water quality criteria are applied as "end-of-pipe" permit limits and are applicable at all stream flows $>7\text{q}_{10}$. Therefore, the wasteload allocation established by this TMDL will be a monthly geometric mean of 200/100 ml and a daily maximum permit limit of 400/100 ml.

The wasteload allocation will initially be applied to all facilities that discharge directly to a recreational segment. Future monitoring and evaluation will be utilized to determine if fecal coliform limitations are necessary for facilities discharging to the recreation segment's tributaries.

2.4.1.2 Dry Weather Discharges: Dry weather discharges can either be from illicit sources, cross-connections or mechanical failure and often exhibit the greatest influence on the base flow conditions of the stream. Thus, it is most appropriate to group these discharges and limit similarly to the WWTFs. Specifically, the wasteload allocations assigned to these discharges shall be a seasonal geometric mean of 200/100 ml and with <10% of the samples >400/100 ml.

2.4.1.3 Non-Discharging Facilities: Several facilities including confined animal feeding operations and lagoons are designed for "zero" discharge. In the case of animal feeding operations, discharges may only occur as the result of a 25 year 24 hour storm event or a chronic wet period with an accumulative precipitation equivalent to a 25 year 24 hour storm. Based on this permitting provision, the WLA for facilities classified as non-discharging will be zero (0).

2.4.2 Load Allocations

The load allocations assigned to these TMDLs will be based upon the stream flow volume and will be defined as:

$$LA_i = Q_i * 400/100 \text{ ml} * C$$

Where:

LA_i = load allocations at the i^{th} flow

Q_i = stream flow at the i^{th} flow

400/100 ml = applicable/target water quality criteria for fecal coliform from Title 117

C = conversion factor

2.4.2.1 Reduction in Nonpoint Source and Natural Background Loads to Meet Water Quality Criteria. It is important to report the reductions necessary to meet the water quality criteria. The necessary reductions were determined based upon the 2001 data, which is considered representative information. The targeted reductions found in Table 2.4.2.1 provide water quality managers with a quantitative endpoint by which implementation planning can be carried out. The noted reductions along with the application of point source controls if achieved should result in the waterbodies fully supporting the primary contact recreation beneficial use.

Table 2.4.2.1 Targeted Nonpoint Source and Natural Background Reductions

Segment	Targeted NPS Reduction	Expected Seasonal Geometric Mean	Expected Percentage of Samples >400/100 ml
MP1-10000	95.5%	18/100 ml	6%
MP1-20000	80%	73/100 ml	9%
MP2-20000	94%	44/100 ml	5%
MP2-40000	37%	88/100 ml	10%

Table 2.3.3.1 NPDES Permitted Discharges to the 303(d) Listed Middle Platte Segments

Recreation Segment	Receiving Water	Facility	NPDES Permit Number	Facility Type	Facility Design Flow (cfs)	Facility Discharge Directly to Recreation Segment?	Approximate Distance to Recreation Segment (stream miles)	Fecal coliform, Limits in NPDES permit?
MP1-10000	MP1-10110	Redhook LLC	NE0131822	Lagoon	2.23	No	5.03	No
	MP1-10100	SID #1 Butler County	NE0114901	Mechanical	0.02	No	8.08	No
MP1-20000	MP2-10100	Grand Island WWTF	NE0043702	Mechanical	23.21	No	12.6	No
	MP2-10200	Wood River WWTF	NE0021661	Mechanical	0.35	No	34.7	No
	MP2-10200	Alda WWTF	NE0042056	Lagoon	0.08	No	23.1	No
	MP1-20100	Cairo WWTF	NE0045080	Lagoon	0.13	No	80.5	No
	MP1-20000	Central City WWTF	NE0025445	Mechanical	0.77	Yes		Yes
	Not Designated	Chapman WWTF	NE0031747	Lagoon	0.12	No	18.4	No
	MP1-20000	Silver Creek WWTF	NE0030724	Lagoon	0.13	Yes		Yes
	MP2-10300	Amherst WWTF	NE0112992	Lagoon	0.1	No	89.1	No
	MP1-20100	Grand Island Regional Landfill	NE0132209	Lagoon	0.52	No	90.7	No
	MP3-10300	Gibbon WWTF	NE0029297	Mechanical	3.09	No	60	No
	MP1-20000	Platte Generating Station	NE0113646	Lagoon	0.01	Yes		Yes
MP2-20000	MP2-20500	IBP Inc. - Lexington	NE0123501	Mechanical	4.46	No	1.2	Yes
	MP2-20000	Cozad WWTF	NE0112828	Mechanical	1.28	Yes		Yes
	Not Designated	Elm Creek WWTF	NE0026042	Lagoon	0.19	No	3.1	No
	MP2-20000	Lexington WWTF	NE0042668	Mechanical	3.09	Yes		No
MP2-40000	MP2-40410	North Platte Airport Authority	NE0112003	Mechanical	0.0012	No	1.45	No

2.4.3 Margin of Safety

A margin of safety (MOS) must be incorporated into TMDLs in an attempt to account for uncertainty in the data, analysis or targeted allocations. The MOS can either be explicit or implicit and for these TMDLs are as follows:

- Decay and/or die off of fecal coliform were not accounted for in either the source assessment or in establishment of the load reduction. That is, the entire concentration/load from the source was assumed to be present within the waterbody and the reductions should focus on the load.
- These TMDLs assumed the effluents discharge the permitted average monthly fecal coliform density allowed. WWTF disinfection systems are often operated to achieve 100% reduction in Fecal coliform. Thus, the actual NPDES permitted point source contribution is likely less.
- In order to achieve the applicable water quality criteria, the load allocation reduction must focus on the extreme measurements. In doing this, the expected seasonal geometric means for the 4 segments are 56-91% less than the required seasonal geometric mean.

2.4.4 Pathogen TMDL Summary

TMDL/Waterbody Loading Capacity = $200/100 \text{ ml (WLA)} + (Q_i * 400/100 \text{ ml} * C) \text{ (LA \& Natural Background)} + \text{Implicit Margin of Safety}$

3.0 Implementation Plan

The implementation of controls to manage fecal coliform within the Middle Platte River Basin includes but is not limited to:

3.1 NPDES Permitted Point Sources

Facilities that discharge directly to the Middle Platte River will be required to meet the wasteload allocations at the end of the pipe. Facilities discharging to tributaries will be evaluated to determine the extent of the effluent's impact on the recreation segment. If deemed significant, a request will be made to limit the fecal coliform concentration discharged from these facilities in the NPDES permit.

In the course of compliance audits, deficiencies in the operation of the WWTF disinfection appurtenances and noncompliance with the NPDES permit limits should be noted and corrective action pursued.

Biosolids (sludge) generated by municipal and industrial facilities are regulated under 40 CFR Part 503 and 40 CFR Part 257, respectively. 40 CFR part 257 requires that facilities and practices not cause nonpoint source pollution of waters of the United States. Part 503 specifically requires that sludge applications be not less than 10 meters from waters of the United States and that the sludge not be applied to frozen, flooded or snow covered ground if the sludge can enter into waters of the United States.

Consistent with Section 3.4 below, a recommendation will be made that all NPDES permittees be required to adhere to items #1 and #2 for land application activities taking place either during or 10 days prior to the recreation season (May 1 – September 30). In those areas where land slope or drainage is such where the application has a greater potential to run-off, or where application has been observed to have run-off, the recommendation will be consistent with #3

3.2 NPDES Storm Water Discharges

The WLA defined in section 2.4.1.1 will be applicable to all NPDES discharges including discharge from regulated stormwater outfall. The NDEQ is responsible for determining the applicability of NPDES stormwater permits for urbanized areas with populations >10,000 but <100,000. As well, other municipal or construction areas can be designated for coverage under an NPDES (stormwater) permit if the NDEQ determines control of the stormwater is necessary.

Facilities discharging stormwater under the authority of a NPDES permit are required to implement the following minimum control measures:

- Implement a public education and outreach program on stormwater impacts
- Comply with State and local public notice requirements when implementing a public participation program.
- Develop and enforce a program to detect and eliminate illicit discharges.
- Develop, implement and enforce a program to reduce pollutants from construction activities.
- Develop, implement and enforce a program to reduce pollutants from post construction activities in new or redevelopment projects
- Develop a pollution prevention/good housekeeping program.

Rather than apply numeric limitations on individual stormwater outfalls, the strategy will be to initially allow the municipalities sufficient opportunity to comply with the NPDES requirements; either voluntarily or under the authority of an NPDES permit. In the future, should additional monitoring data indicate the minimum control measures are inadequate or have not been incorporated; consideration will be given to application of wasteload allocations for the outfalls in the area of concern.

At this time no MS4 permits have been issued to municipalities residing in the Middle Platte Basin. The issuance of future permits will likely be contingent upon the collection of additional data, the future beneficial use status of the impaired segments and the voluntary actions the candidate facilities have taken to minimize pollutants in the stormwater discharges.

3.3 Dry Weather Discharges

Title 119 – Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System, Chapter 2 states:

“All persons discharging pollutants from a point source into any waters of the State are required to apply for and have a permit to discharge.”

Discharges not permitted should be required to obtain the proper authorization to discharge. All discharges are then subject to the appropriate limitations consistent with the WLAs established by this TMDL. Elimination of the discharge should be undertaken in the event permitting and control is not feasible.

3.4 Animal Feeding Operations

Title 130 – Rules and Regulations Pertaining to Livestock Waste Control states:

001 A livestock waste control facility shall be required for an existing or proposed livestock operation of three hundred animal units or larger, when livestock wastes:

001.01 Violate or threaten to violate Title 117 (Neb. Administrative Code (NAC)), Nebraska Surface Water Quality Standards;
001.02 Violate or threaten to violate Title 118 (NAC), Ground Water Quality Standards and Use Classification;
001.03 Discharge into waters of the State; or
001.04 Violate The Nebraska Environmental Protection Act.

002 Any livestock operation less than three hundred animal units is exempt from the permitting process, including the requirement to request an inspection, unless there has been a confirmed discharge into waters of the State, or the Department has determined that because of conditions at the livestock operation there is a high potential for discharge into waters of the State in which case the Department shall notify the owner of the livestock operation by certified mail that the owner is subject to the Livestock Waste Management Act.

When a livestock waste control facility is required the owner/operator must also be issued a construction and/or a state-operating permit. State operating permits require facilities be properly operated and maintained to prevent water pollution and to protect the environment of the State.

Livestock waste control facilities for open lots, by regulation must be designed and constructed to contain all waste generated under conditions less than a 25 year 24 hour precipitation event. Confined animal feeding operations are required to maintain 180 days of storage or a lagoon to treat the waste products. Meeting these permit requirements should equate to “zero” discharge during under conditions less than a 25 year 24 hour precipitation event, or a chronic wet period.

Wastewater and biosolids (manure) produced by the animal feeding operations are most often land applied for beneficial reuse. Permitted facilities are required to follow best management practices (BMPs) for the land application as defined in Title 130, Chapter 11. Those BMPs include:

1. Utilize application areas which are under proper conservation treatment to prevent run-off into waters of the State
2. Not apply waste within 30 feet of any stream, lake or impounded waters identified in Chapter 6 and Chapter 7 of Title 117, unless in accordance with an approved comprehensive nutrient management plan
3. When waste is applied within 100 feet of any streams, lakes an impounded waters identified in Chapter 6 and 7 of Title 117, the Department may also require additional buffer and/or vegetative buffers, and that the livestock waste be applied in a manner which reduces potential for run-off of nutrients or pathogens by incorporation, injection of waste or other approved practices.

Based upon the above, it shall be recommended that the NDEQ’s Agriculture Section stipulate in the state operating or other permits, for facilities located in the Middle Platte Basin, that the application of livestock waste occurring during or 10 days prior to the Recreation Season (May 1 – September 30) be consistent with the above #1 and #2 and the application setback be the minimum of 30 feet regardless of the status of the comprehensive nutrient management plan. In those areas where land slope or drainage is such where the application has a greater potential to run-off, or where application has been observed to have run-off, the recommendation will be consistent with the requirements of #3 with the minimum setback being 100 feet.

3.5 Exempt Facilities/Other Agricultural Sources

Animal feeding operations are exempt from the regulations set forth in Title 130 if:

- The operation is less than 300 animal units
- There has not been a confirmed discharge to waters of the State, or
- The Department has determined that because of conditions at the livestock operation there is **not** a high potential for discharge into waters of the State

Periodically, the NDEQ will receive a complaint on or a request for an inspection from a facility operating with <300 animal units. Should deficiencies be noted during the on-site visit, the owners/operator will often be given an opportunity to make corrections prior to enforcement or permit action being taken. In the event the efforts at voluntary compliance fail, civil enforcement or the issuance of a permit will be pursued to bring about the necessary corrective measures.

Because these facilities are “non-regulated”, it is difficult to assess the impacts to the environment. As well, pastures or other temporary feeding practices may contribute to the fecal coliform impairments if conditions are such that run-off from the site occurs. In lieu of regulatory requirements, the NDEQ will first look to the USDA-Natural Resource Conservation Service for assistance utilizing programs under the control of the Service such as Conservation Reserve Program, Environmental Quality Incentives Program, Conservation Farm Option, Conservation of Private Grazing Land Initiative, the Wetlands Reserve Program and others that aid in the maintenance and improvement of water quality.

3.6 Section 319 – Nonpoint Source Management Program

The United States Environmental Protection Agency supplies grant funds to states to aid in managing nonpoint source pollution. When grant applications are submitted for review, an effort should be made to include the control of fecal coliform and surface run-off for the proposed projects in the Middle Platte Basin. As well, an effort will be made to redirect applicants to develop proposals consistent with the goals of this TMDL. Preference may be given to those projects that will have a direct reduction in the fecal coliform contributions of nonpoint source discharges.

3.7 Non-Government Organizations

Several non-governmental organizations with an emphasis on agriculture disseminate information to their members on a regular basis. As well, some of the organizations have established environmental education programs to assist in the understanding of environmental regulations and topics. The NDEQ will communicate with these entities in an attempt to utilize the membership distribution process as a means of providing information on the water quality impairments, the TMDL and suggestions to assist in solving the identified problems.

3.8 Reasonable Assurances

The NDEQ is responsible for the issuance of NPDES or state operating permits for industrial and municipal wastewater discharges, regulated stormwater discharges and livestock operations (open lot or confined). Issued permits must be consistent with or more stringent than the wasteload allocations set forth by this TMDL. Compliance with the permit may require construction or modification of a facility and the issued permits may account for this through the inclusion of a compliance schedule or administrative order.

Effective management of nonpoint source pollution in Nebraska necessarily requires a cooperative and coordinated effort by many agencies and organizations, both public and private. Each organization is uniquely equipped to deliver specific services and assistance to the citizens of Nebraska to help reduce the effects of nonpoint source pollution on the State’s water resources. While a few of the organizations have been previously identified, Appendix A is a more complete compilation of those entities that may be included in the implementation process. These agencies have been identified as being responsible for program oversight or fund allocation that may be useful in addressing and reducing fecal coliform contributions to the Middle Platte River. Participation will depend on the agency/organization’s program capabilities.

4.0 Future Monitoring

Future monitoring will generally be consistent with the rotating basin monitoring scheme. That is, annually, 2 or 3 river basins in the same geographic location are the focus of the monitoring effort. The Middle Platte basin was monitored in 2001 and will again be targeted in 2006. An effort will be made to expand the monitoring in an effort to isolate areas of concern and to focus resources to address identified problems.

Periodically, compliance monitoring will be conducted at NPDES permitted facilities to verify the permit limitations are being adhered to. Facilities are selected either randomly or in response to inspection or reported information.

As well, the NPDES permits require self-monitoring of the effluent by the permittee with the frequency of the monitoring being based on the discharge characteristics. The data is then reported to NDEQ quarterly, semiannually or annually and entered into the EPA's Permitting Compliance System. The compliance monitoring and self-monitoring information will be used in assessing the success of the TMDL.

Recently, analytical techniques have been introduced that may provide a greater level of confidence in the identification of pollutant sources. These techniques include microbial source tracking and specialized sampling the targets human wastewater. As the science progresses the application of these analytical techniques may become a valuable tool for source identification and pollutant reduction.

5.0 Public Participation

The availability of the TMDLs in draft form was published in the Columbus Telegram, Grand Island Independent, Kearney Daily Hub, Lexington Clipper Herald, Lincoln Journal-Star and the North Platte Telegraph with the public comment period running from February 12, 2003 March 14, 2003. These TMDLs were also made available to the public on the NDEQ's Internet site and announcement letters were mailed to interested stakeholders.

In response to the public notice, comment letters were received from the Nebraska Pork Producers and the Nebraska Wildlife Federation. The comments were reviewed and considered however; no changes were made to the TMDLs as a result of the correspondence. Copies of the letters and the NDEQ's response to those comments have been included with the submittal to EPA Region 7.

6.0 References

Chapman, Shannen, S. Omernik, J.M., Freeouf, J.A., Huggins, D.G., McCauley, J.R., Freeman, C.C., Steiner, G.A., Robert, T., Schlepp, R.L., 2001. Ecoregions of Nebraska and Kansas (color poster with map, descriptive text, summary tables and photographs): Reston, Virginia, U.S. Geological Survey

NDEQ 1992. Title 119 – Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 1998. 1998 Section 303(d) List of Impaired Waters. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 2000a. 2000 Nebraska Water Quality Report. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 2000b. Title 117 – Nebraska Surface Water Quality Standards. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 2001a. Methodology for Waterbody Assessment and Developing the 2002 Section 303(d) List of Impaired Waterbodies for Nebraska. Nebraska Department of Environmental Quality. Lincoln, NE.

6.0 References (continued)

NDEQ 2001b. Title 130 – Rules and Regulations Pertaining to Livestock Waste Control. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 2002a. 2002 Section 303(d) List of Impaired Waters. Nebraska Department of Environmental Quality. Lincoln, NE.

NDEQ 2002b. Nebraska's Approach for Developing TMDLs for Streams Using the Load Duration Curve Methodology. Nebraska Department of Environmental Quality. Lincoln, NE.

NDNR. _____. Nebraska Department of Natural Resources Databank, NDNR Internet Site, Nebraska Department of Natural Resources. Lincoln, NE.

NNRC 1975. Middle Platte River Basin Water Quality Management Plan. Nebraska Natural Resources Commission. Lincoln, NE.

Appendix A – Federal, State Agency and Private Organizations Included in TMDL Implementation.

FEDERAL

- ☐ Bureau of Reclamation
- ☐ Environmental Protection Agency
- ☐ Fish and Wildlife Service
- ☐ Geological Survey
- ☐ Department of Agriculture - Farm Services Agency
- ☐ Department of Agriculture - Natural Resources Conservation Service

STATE

- ☐ Nebraska Association of Resources Districts
- ☐ Department of Agriculture
- ☐ Department of Environmental Quality
- ☐ Department of Roads
- ☐ Department of Water Resources
- ☐ Department of Health and Human Services
- ☐ Environmental Trust
- ☐ Game and Parks Commission
- ☐ Natural Resources Commission
- ☐ University of Nebraska Institute of Agriculture and Natural Resources (IANR)
- ☐ UN-IANR: Agricultural Research Division
- ☐ UN-IANR: Cooperative Extension Division
- ☐ UN-IANR: Conservation and Survey Division
- ☐ UN-IANR: Nebraska Forest Service
- ☐ UN-IANR: Water Center and Environmental Programs

LOCAL

- ☐ Natural Resources Districts
- ☐ County Governments (Zoning Board)
- ☐ City/Village Governments

NON-GOVERNMENTAL ORGANIZATIONS

- ☐ Nebraska Wildlife Federation
- ☐ Pheasants Forever
- ☐ Nebraska Water Environment Association
- ☐ Nebraska Corn Growers Association, Wheat Growers, etc.
- ☐ Nebraska Cattlemen's Association, Pork Producers, etc
- ☐ Other specialty interest groups
- ☐ Local Associations (i.e. homeowners associations)

Appendix B – Fecal Coliform Data Collected in 2001 from Middle Platte Tributaries

Monitoring information collected during the recreation season in 2001 was not only obtained from sites on the segments assigned the recreation beneficial use but also from 8 tributaries. These sites were chosen based upon the location of a USGS or NDNR gage. The location of the sites and the area of the basin drainage evaluated by the sites is shown in Figure B1. Table B1 then provides a summary of the tributary monitoring information.

Figure B1. Tributary Monitoring Locations in the Middle Platte Basin

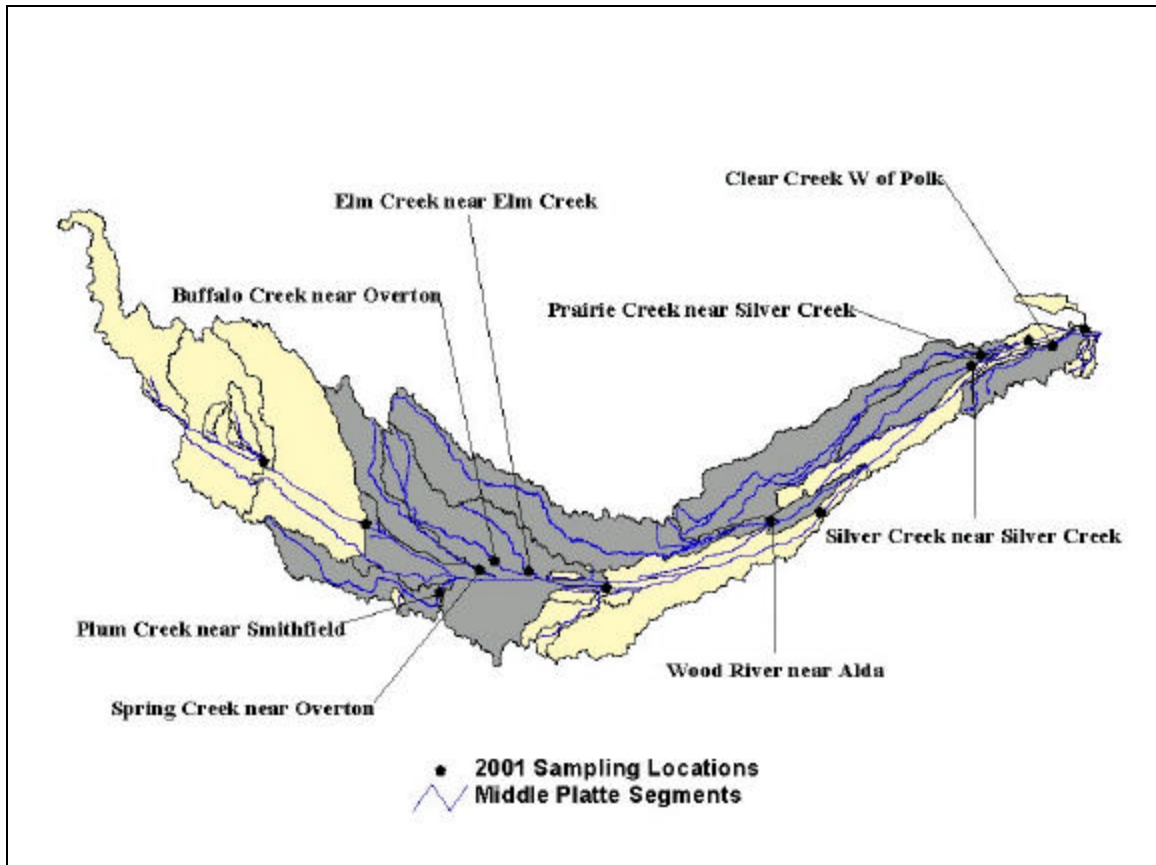


Table B1. Summary of 2001 Monitoring from Middle Platte Tributaries

Stream	Title 117 Segment Identification	Location	Number of Samples	Recreation Season Geometric Mean (#/100 ml)	Number of Samples >400/100 ml	% of Samples >400/100 ml
Clear Creek	MP1-10100	West of Polk, NE	22	708	18	82
Prairie Creek	MP1-20100	Near Silver Creek	22	342	11	50
Silver Creek	MP1-20200	Near Silver Creek	12	124	1	8
Wood River	MP2-10200	Near Alda	21	859	18	86
Elm Creek	Not Designated	Near Elm Creek	16	951	14	88
Buffalo Creek	Not Designated	Near Overton	21	558	16	76
Spring Creek	MP2-20300	Near Overton	21	134	8	38
Plum Creek	MP2-20400	Near Smithfield	18	1119	13	72